

What is Claimed is:

1. An apparatus for imparting mechanical vibration on a down-hole drilling system, comprising:

a body having ports configured to pass fluid through the body;

first and second couplers configured to couple the body to the down-hole drilling system; and

a rotating member located at least partially in the body and rotatable about an axis of rotation in response to flow of the fluid, wherein rotation of the rotating member generates mechanical vibration imparted on the down-hole drilling system.

2. The apparatus of claim 1 wherein a center of gravity of the rotating member is offset from the axis of rotation.

3. The apparatus of claim 1 wherein the rotating member comprises an outer spiraled geometry.

4. The apparatus of claim 1 wherein the body comprises an inner spiraled geometry.

5. The apparatus of claim 1 wherein the rotating member includes:

a finned member at least partially contained in the body and rotatable about the axis of rotation in response to the fluid flow; and

a shaft coupled to the finned member and having a center of gravity offset from the axis of rotation.

6. The apparatus of claim 5 wherein the rotating member further includes a mass coupled to the shaft.

7. An energy accelerator for imparting energy to a down-hole drilling member, comprising:

a body configured to receive external energy;

a converter located at least partially within the body and configured to convert the external energy into vibration energy; and

at least one vibrating member configured to impart the vibration energy to the down-hole drilling member.

8. The energy accelerator of claim 7 wherein the down-hole drilling member is configured to rotate about an axis of rotation and the vibrating member vibrates in response to the vibration energy in one of a first direction substantially parallel with the axis of rotation and a second direction substantially orthogonal to the axis of rotation.

9. The energy accelerator of claim 8 wherein the vibrating member vibrates in the first and second directions.

10. The energy accelerator of claim 7 wherein the vibrating member vibrates in response to the vibration energy in a plurality of random directions.

11. The energy accelerator of claim 7 wherein the vibrating member vibrates in response to the vibration energy at a frequency ranging between about 0.5 Hz and about 50 Hz.

12. The energy accelerator of claim 7 wherein the vibrating member vibrates in response to the vibration energy at an amplitude ranging between about 1 G and about 15 G.

13. The energy accelerator of claim 7 wherein an interior surface of the body comprises a first lobed geometry having a first number of lobes and wherein an exterior surface of vibrating member comprises a second lobed geometry having a second number of lobes, the second number of lobes not greater than the first number of lobes.

14. The energy accelerator of claim 7 wherein:
the vibration energy is energy accelerating vibration energy;
the external energy comprises drilling vibration energy generated at least partially by the drilling member; and

the converter includes a piezoelectric device configured to convert the drilling vibration energy into the energy accelerating vibration energy.

15. The energy accelerator of claim 7 wherein the vibrating member is integral to the body.

16. The energy accelerator of claim 7 wherein the vibrating member is integral to the converter.

17. The energy accelerator of claim 7 wherein the external energy comprises fluid flow energy.

18. The energy accelerator of claim 7 wherein the external energy comprises electrical energy.

19. The energy accelerator of claim 7 further comprising a regulator configured to limit the vibration energy imparted to the down-hole drill member by regulating a flow of the external energy to the body.

20. A down-hole drilling system, comprising:
a drill string assembly;
a drilling member; and
an energy accelerator coupled between the drill string assembly and the drilling member,
the energy accelerator including:
a body having ports configured to pass fluid through the body;
first and second couplers configured to couple the body between the drill string assembly and the drilling member; and
a rotating member located at least partially in the body and rotatable about an axis of rotation in response to flow of the fluid, wherein rotation of the rotating member generates mechanical vibration imparted on the drilling member.